SEQUENCE SWITCHES
PROCEDURE FOR REPLACING TIPS OF WORN CONTACT SPRINGS

1. GENERAL

1.01 This section covers procedures to be followed in replacing the tips of worn contact springs of sequence switches.

1.02 This section is reissued to revise the list of materials and to delete duplicated information.

1.03 Replacement spring tips are provided as follows.

(a) For use on other than A cam contact springs, two lengths of replacement spring tips are provided which are applicable to both inner and outer springs as covered in 1.04. The long tip may be identified by the bulge in the center rib of its mounting lug. Each of the two lengths is available with either phosphor-bronze or No. 1 contact metal tips, the use of which is covered in 1.05. The spring tip with No. 1 contact metal may be identified by the golden color of the material welded to the contacting end.

(b) For use on the A2 contact spring, a replacement spring tip having the contacting end chromium plated is provided. This spring tip may be identified by the band of bronze between the chromium plated and tinned portion of the spring.

1.04 If spring tips are to be applied to adjacent springs (for example, B3 and C2 springs or B4 and C1 springs), a long tip [1.03(a)] should be mounted on one spring and a short tip on the other spring; otherwise, either tip may be used.

1.05 Except as indicated below, replacement spring tips having phosphor-bronze tips should be used. Spring tips having No. 1 contact metal tips are recommended for the following conditions.

(1) The tip to be replaced is working on a pitted bronze cam.

(2) Where the traffic conditions are such that it would be necessary to replace a phosphor-bronze spring two or more times within the anticipated life of the office.

(3) When the nature of the circuit requires that the bronze cam be replaced with a silver-surfaced cam. Since only one member of a pair of mating contacts need be of precious metal to improve the connection, the use of the spring tip with No. 1 metal working surfaces obviates the need for replacing the cam.

Note: When a No. 1 metal tip is used, the associated contact spring assembly mounting bracket shall be marked with a white stripe approximately 1/16 inch wide to indicate that one or more of the spring tips are No. 1 metal. If the index tab is at the front of the mounting bracket, the white stripe shall extend across the bracket directly below the letters on the tab. If the index tab is at the rear of the bracket, the white stripe shall be located on the vertical surface at the front of the bracket directly above the contact spring assembly. Use the white stamping ink applied with the R-2119 brush.

1.06 The procedures covered by this section are not applicable to contact springs that have been crimped to shorten them. In cases where crimped springs are worn, the entire spring assembly should first be replaced as covered in Section 030-801-801. Then the tip of the contact spring to be shortened should be replaced as covered in this section and the new tip positioned to meet the special requirements which applied to the crimped spring. This eliminates the need for the crimping operation and also permits future replacement of the tip without again replacing the entire spring assembly.

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2. TOOLS AND MATERIALS

2.01 *List of Tools and Materials*

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
235	Spring Adjuster
256	Spring Adjuster
380A	Spring Adjuster
KS-6320	Orange Stick
KS-6854	Screwdriver
KS-14440, List 1 or 2	Soldering Copper
KS-14441	Pliers
KS-14442	Cut-Nippers
KS-14443	Guide
—	3-Inch C Screwdriver (or the replaced 3-inch cabinet screwdriver)
—	6-1/4 Inch Round Handle, Needle, Equaling, Swiss No. 2 Cut File
MATERIALS	
KS-7851	No. 5 Varnished Cambric Sleeving (yellow) or Equivalent
KS-14666	Cloth
P-463582	Spring Tip (short, split, phosphor-bronze)
P-463583	Spring Tip (long, split, phosphor-bronze)
P-463584	Spring Tip (short, nonsplit, phosphor-bronze)
P-463585	Spring Tip (long, nonsplit, phosphor-bronze)
→P-12B195	Spring Tip (for A2 contact springs)
P-16A284	Spring Tip (short, split, No. 1 Metal)
P-16A285	Spring Tip (short, nonsplit, No. 1 Metal)
P-16A286	Spring Tip (long, split, No. 1 Metal)
P-16A287	Spring Tip (long, nonsplit, No. 1 Metal)
—	E Rosin Core Solder
→R-2119	Brush
R-2881	Tube of White Stamping Ink

3. PROCEDURES FOR REPLACING WORN CONTACT SPRING TIPS

General

3.01 Make busy, in the approved manner, the circuits associated with the sequence switch to be worked on and the circuits of the switches directly above and below. Remove the associated fuses. Spread a KS-14666 cloth over the sequence switch below the switch being worked on to protect it from debris when replacing the tips.

Contact Springs Other Than A Cam Springs

3.02 Place the KS-14443 guide flat upon the spring assemblies so that the straight edge rests against the index tabs on the mounting brackets. If any of the index tabs are located at the front of the mounting brackets, make certain that the narrow part of the guide is over the spring the tip of which is to be replaced. Where all the index tabs are located at the rear of the mounting brackets, make certain that the wide part of the guide is over the spring the tip of which is to be replaced. This will insure that the proper length of stub is provided for mounting the new spring tip.

Outer Contact Springs

3.03 Cut off a piece of KS-7851 No. 5 varnished cambric sleeving approximately 9 inches long. Tie a knot at one end of the sleeving to close this end. Lift the spring, the tip of which is to be replaced, from the cam with the KS-6320 orange stick and place the sleeving over the end of this spring.

3.04 With the guide properly located as described in 3.02, and the sleeving in place as covered in 3.03, place the jaws of the KS-14442 cut-nippers over the spring the tip of which is to be replaced and push the jaws back against the guide as shown in Fig. 1.

> ***Caution: Take care that only the spring to be cut off is between the jaws of the cut-nippers.***

Push the sleeving against the jaws of the cut-nippers. Hold the cut-nippers so that the cutting edges are vertical. Then cut off the tip of the spring. If difficulty is experienced with the cut-nippers in cutting off the tip, this may be due to misalignment of the jaws. In this case proceed

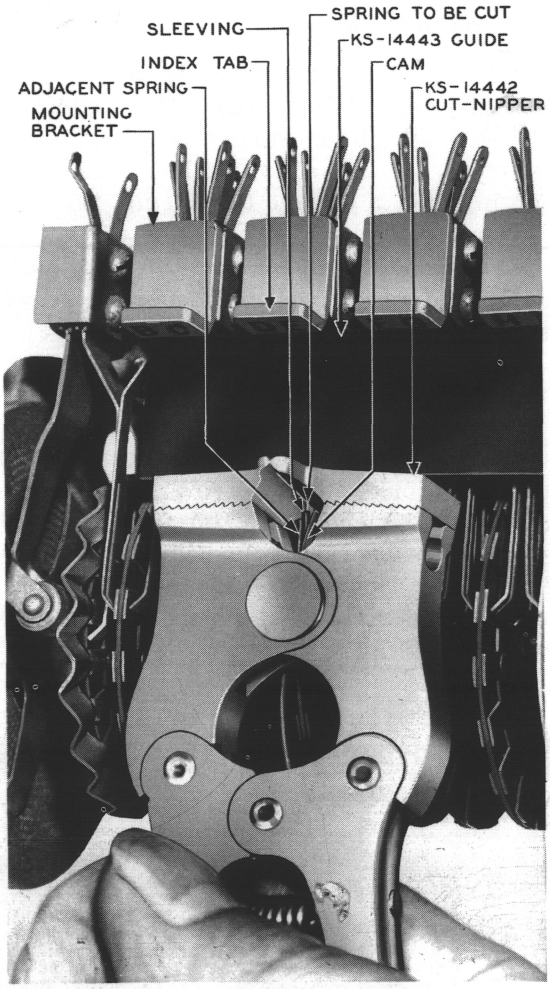

Fig. 1 – Method of Cutting Worn Outer Spring Tips

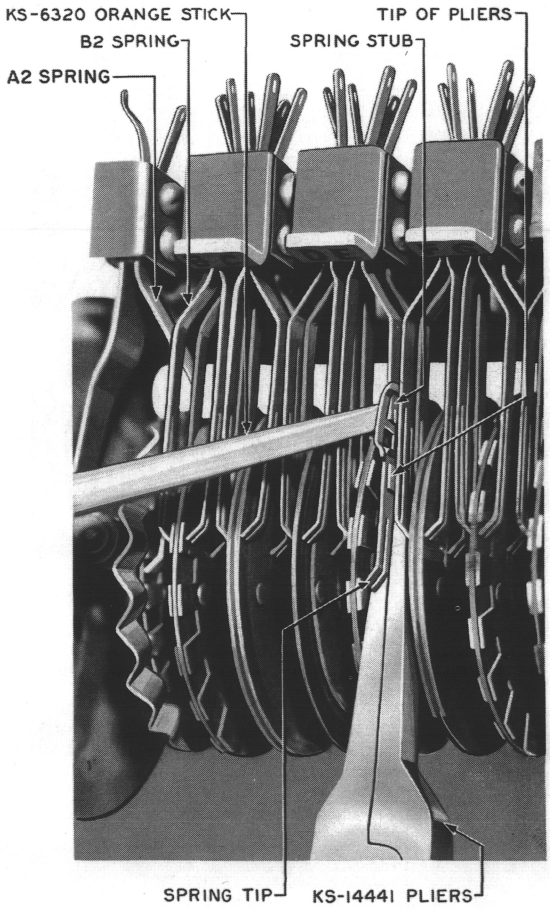

Fig. 2 – Method of Mounting Outer Spring Tips

as covered in Part 4. Withdraw the sleeving with the severed tips of the spring. When the sleeving is filled with spring tips, empty or discard it. Remove the guide and burnish the outer 1/2 inch of the top edge of the top corners of the spring stub with the No. 2 cut file. Before putting a new tip on a B2 spring stub, it will generally be necessary to adjust the stub with the 256 spring adjuster to obtain clearance with the A2 spring.

3.05 Except when placing a new spring tip on a B2 spring, grasp the tip from below just behind the bend at the contact end, using the KS-14441 pliers. For B2 springs, grasp the new tip from above instead of below. Push the spring tip onto the spring stub. Use the KS-6320 orange stick to guide the stub into the openings of the tip as shown in Fig. 2. Push straight in and at the same time move the outer end of the tip up and down slightly to facilitate mounting the tip on the spring stub.

3.06 Position the new spring tip to meet the applicable requirements covered in Section 030-801-701. Where the tip has been mounted in a position where a crimped spring was previously used (see 1.06), position the tip so that it meets the requirements covered on the circuit requirement table as well as in Section 030-801-701. Solder the spring tip to the spring stub, using the KS-14440 soldering copper and E rosin core solder. Position the solder before heating the parts with the soldering copper as shown in Fig. 3.

Caution: Avoid too long a heating period to prevent changing the temper of the spring. If the spring being soldered becomes too hot, the spring will be softened and difficulty may be experienced in retensioning the repaired spring.

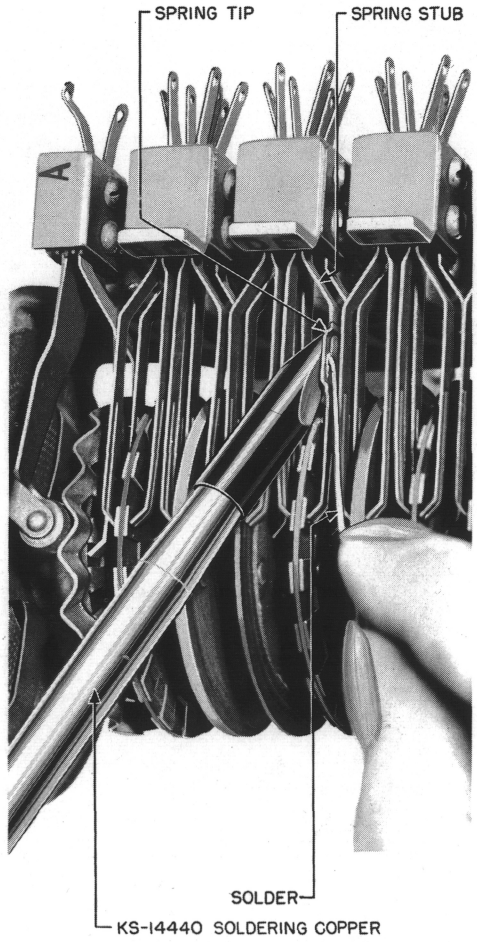

Fig. 3 – Method of Soldering Spring Tips

Take care to apply the solder only along the line between the top edge of the spring stub and the inside of the lug of the spring tip. Avoid applying too much solder which would tend to reduce the clearance between springs.

3.07 Check that a good solder bond has been obtained. Then check that the requirements specified in Section 030-801-701 are met. Where a spring tip has been mounted in a position in which a crimped spring was previously used, check that the position of the tip meets the requirements covered on the circuit requirement table.

3.08 After completing replacement of spring tips, remove the cloth from the lower switch and remount the fuses. Restore the circuits to service.

Inner Contact Springs

3.09 With the guide properly located as described in 3.02, place the 380A spring adjuster on the inner spring the tip of which is to be replaced. If the slot in the spring adjuster is too narrow to engage the spring, try another 380A spring adjuster or slightly widen the slot with the KS-6854 screwdriver. Push the adjuster back on the spring so that it rests against the guide as shown in Fig. 4.

3.10 With the handle of the 380A spring adjuster held horizontally, swing the adjuster as far as possible from side to side until the spring breaks off. Remove the guide. Burnish the outer 1/2 inch of the top edge and the top corners of the spring stub using the No. 2 cut file. In case a smooth break is not obtained, also remove any burrs on the sides at the end of the spring stub with the file.

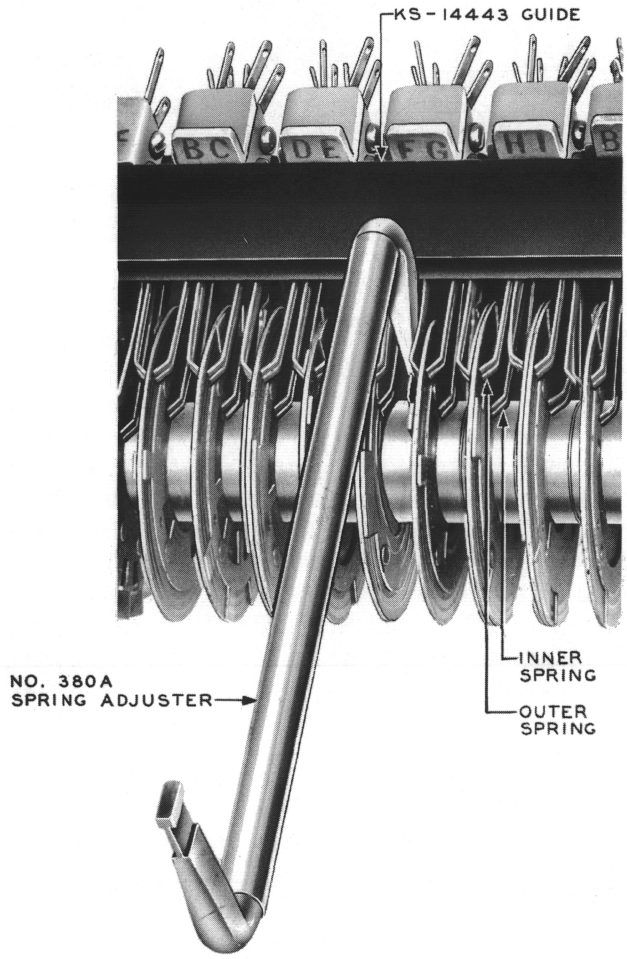

Fig. 4 – Method of Removing Worn Inner Spring Tips

3.11 If necessary, adjust the spring stub so that it is approximately parallel to the adjacent spring, using the 235 spring adjuster.

3.12 With the KS-14441 pliers, grasp the new spring tip from above just behind the bend at the contact end. From below, place the 235 spring adjuster on the spring stub and slide the adjuster to the rear of the stub. In the case of a stub having an offset at the rear, place the adjuster on the offset portion of the stub. Push the new tip on the spring stub using the 235 spring adjuster to guide the stub into the openings in the tip. Push straight in and at the same time move the outer end of the tip up and down slightly to facilitate mounting the tip on the stub.

3.13 Position the new spring tip to meet the applicable requirements covered in Section 030-801-701. Where the tip is mounted in a position where a crimped spring was previously used (see 1.06), position the tip to meet the requirements covered on the circuit requirement table as well as in Section 030-801-701.

3.14 Solder the spring tip to the spring stub using the KS-14440 soldering copper and the E rosin core solder. Insert the solder between the inner and outer springs and position it on the tip as shown in Fig. 3 before heating the parts.

Caution: Avoid too long a heating period to prevent changing the temper of the spring. If the spring being soldered becomes too hot, the spring will be softened and difficulty may be experienced in retensioning the repaired spring.

Take care to apply the solder only along the line between the top edge of the spring stub and the inside of the lug of the spring tip. Avoid applying too much solder, which would tend to reduce the clearance between springs.

3.15 Check that a good solder bond has been obtained. Then check that the requirements specified in Section 030-801-701 are met. Where a spring tip has been mounted in a position where a crimped spring was previously used, check that the position of the tip meets the requirements covered on the circuit requirement table.

3.16 After completing replacement of spring tips, remove the cloth from the lower switch and remount the fuses. Restore the circuits to service.

A2 Contact Springs (outer A cam contact springs)

3.17 Place the 380A spring adjuster on the spring so that approximately 1/2 inch of the spring is exposed in front of the adjuster. If the slot in the spring adjuster is too narrow to engage the spring, try another 380A spring adjuster or slightly widen the slot with the KS-6854 screwdriver.

3.18 With the handle of the 380A spring adjuster held horizontally, swing the adjuster as far as possible from side to side until the spring breaks off. Burnish the outer 1/2 inch of the top edge and the corners of the spring stub using the No. 2 cut file. In case a smooth break is not obtained, also remove any burrs on the sides at the end of the spring stub with the file.

3.19 If necessary, adjust the spring stub so that it is approximately parallel to the adjacent spring on the B cam, using the 235 spring adjuster.

3.20 With the KS-14441 pliers, grasp the new spring tip from above just behind the bend at the contact end. Push the spring tip onto the spring stub, using the KS-6320 orange stick to guide the stub into the openings of the tip. Push straight in and at the same time move the outer end of the tip up and down slightly to facilitate mounting the tip on the spring stub.

3.21 Position the spring tip to meet the A spring clearance requirement in Section 030-801-701. Solder the spring tip to the spring stub using the KS-14440 soldering copper and E rosin core solder. Position the solder in a manner similar to that shown in Fig. 3 before heating the parts with the soldering copper.

Caution: Avoid too long a heating period to prevent changing the temper of the spring. If the spring being soldered becomes too hot, the spring will be softened and difficulty may be experienced in retensioning the repaired spring.

Take care to apply the solder only along the line between the top edge of the spring stub and the inside of the lug of the spring tip. Avoid applying too much solder which would tend to reduce the clearance between springs.

3.22 Check that a good solder bond has been obtained. Check requirements specified in Section 030-801-701 which may have been disturbed. Remove the cloth from the lower switch and remount the fuses. Restore the circuits to service.

4. MAINTENANCE OF TOOLS

4.01 ***KS-14442 Cut-Nippers:*** If the cut-nippers do not cut off the spring tips satisfactorily, the trouble may be due to misaligned cutting edges of the jaws. To correct, remove the jaw mounting screw of the jaw closer to the handle, using the 3-inch C screwdriver. Insert one or more thicknesses of thin paper, such as cigarette paper, between the jaw and the handle. Insert and tighten the jaw mounting screw and check the alignment of the cutting edges. If necessary, repeat this procedure until the cutting edges are satisfactorily aligned.